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SUBMISSION OF ENGLISH TRANSLATION AND AFFIDAVIT OF ACCURACY

Commissioner for Patents
P.O. Box 1450
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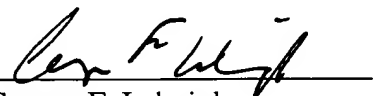
Sir:

Submitted herewith is an English translation with Affidavit of Accuracy of German priority document no. 198 32 974.1 on which a claim to priority was made under 37 C.F.R. § 119. The Examiner is respectfully requested to acknowledge receipt of this document.

Respectfully submitted,



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Specification

Apparatus and process for the development of a virtual model of an installation.

The invention relates to an apparatus as well as a process for the development of a virtual model of an installation as an image of a real installation.

In the case of a real installation of this type we are dealing, for example, with a planned or an already existing industrial installation, with machines or with individual assemblies of the same. In these cases it is frequently the case in practice that the real installations do not agree with the original plans for the installation, since, for example, in the development of the installation, special adaptations or upgrades have already been performed or their plans do not contain the information necessary for further treatment by data processing.

The objective of the invention is to specify a process and an apparatus for simple development of a virtual model of an installation as a representation of a real installation.

This objective is realized by an apparatus for the development of a virtual model of an installation as a representation of a real installation, with a storage device for storing screen data for the real installation, with a second storage device for storing informational data for installation components from a component library, with a third storage device for storing the virtual model of the installation, and with an evaluation and control apparatus for the comparison of informational data for the components of the installation with the screen data for the real installation, for the recognition of installation components in the screen data, for derivation of assumptions concerning components in the screen data, and for the generation of each recognized component of the installation for the virtual model of the installation.

This objective is realized by a process for the development of a virtual model of an installation as

an image of a real installation in which the virtual model of the installation is generated from screen data for the real installation by components of the installation from a component library being compared to screen data of the real installation and in case of agreement each recognized component of the installation being added to the virtual model of the installation.

The starting point for the development of the virtual model of the installation is two data sources. The first data source contains the screen data for the real installation while the second data source contains predefined components of the installation that have been used in the construction of the installation. The evaluation and control apparatus performs a screen analysis, that is, the information of the screen data and the predefined components of the installation are, if necessary with support from the user, combined and evaluated. As soon as a component of the installation is recognized in the screen data, it is added to an image for the virtually generated model of the installation. Users can thus retroactively virtually generate the real installation themselves based on the screen data for a real installation and the aid of a component library for the components of the installation used. They have hereby an overview of the current upgrade status of the installation, which, if necessary, can also be updated to a new status in case of changes of the installation.

A most extensively automatic mode of operation of the apparatus is insured by the evaluation and control apparatus for screen analysis of the screen data, of the informational data for the components of the installation from the component library, of the current state of the virtual model of the installation, and/or of additional information from a user being provided.

The screen analysis can be done in an advantageous manner in such a way that the evaluation apparatus from the screen analysis of geometric information of the screen data and/or the

components from the component library is provided.

For easily grasped and comprehensive user guidance as well as an interface, it has proven itself advantageous that the apparatus has a display apparatus for the representation of three views, where the first view is intended for the representation of the real installation based on the screen data, the second view is intended for the representation of the informational data for the components of the installation from the component library, and the third view is intended for the representation of the virtual model of the installation.

Development of the virtual model of the installation controlled by the user can be accomplished in a simple manner by the evaluation and control apparatus for the control of the construction of the virtual model of the installation being provided, in such a way that a component of the installation selected from the component library is intended to be shifted into the first region of the screen, which is assigned to the representation of the screen data for the real installation.

An assignment of the respective component of the installation to the "real" component of the installation contained in the screen data for the real installation is done advantageously in such a way that the evaluation and control apparatus brings the component of the installation, selected and shifted into the first view, into agreement with the component of the real installation recognizable in the screen by an evaluation, in particular for geometric characteristics, and after successful detection assigns it to this component.

The certainty of recognition of the components of the installation can be increased further by the structural information assigned to the components of the installation, in particular geometric and functional ones, being evaluated as well for assignment of the components of the installation to the screen data.

An easily grasped overview, adapted to the respective state of the development process, can be

insured by providing the evaluation and control apparatus for the addition of a component of the installation to the third view of the virtual model of the installation after successful recognition.

An automatic mode of operation of the apparatus can be achieved by the evaluation and control apparatus being provided for the control of an automatic function, in which components of the installation are automatically selected, positioned, and added into the model of the installation. The selection of the components of the installation and their assignment to the screen data for the real installation or their positioning in the virtual modal of the installation is done therein, in so far as required, taking into account structural information by generating of assumptions and verification of the assumptions by the evaluation and control apparatus.

The screen data registration of the screen data can be accomplished by a digital photo apparatus, a digital video camera, digitized photographs, and/or data from a CAD system being provided.

A comprehensive overview of the entire real installation is achieved by various views of the real installation being provided, whereby on recognition of a component of the installation the component of the installation recognized is assigned to all screen data for the installation.

In the following, the invention is described and explained in more detail with the aid of the exemplary embodiment represented in the figures.

Shown are:

FIGURE 1 a block diagram with a schematic representation of an apparatus for the development of a model of the installation,

FIGURE 2 a section of the screen with a region of the screen with a digital photograph of a real installation,

FIGURE 3 a section of the screen with one view of the real installation and with a second view of an installation component "tank,"

FIGURE 4 a section of the screen with one view of the real installation, with a second view of an installation component "tank," and with a third view of a virtual model of the installation,

FIGURE 5 a section of the screen with one view of the real installation and with a second view of an installation component "valve,"

FIGURE 6 a section of the screen with one view of the real installation, with a second view of an installation component "valve," and with a third view of the virtual installation,

FIGURE 7 a section of the screen with one view of the real installation, with a second view of an installation component "conduit," and with a third view of the virtual model,

FIGURE 8 a section of the screen with one view of the installation component "tank" and with a second view of structural data assigned to the installation component "tank,"

FIGURE 9 an information, operating, and observation system on the basis of the virtual model, and

FIGURE 10 an exemplary embodiment of a data model for the setup of the component library and the virtual model.

FIGURE 1 shows a block diagram for an apparatus for the development of a virtual model of an installation. The reference number 1 denotes a real installation. With the aid of a screen registration system 3, images of the real system 1 are registered which are stored in a storage device 20 of the apparatus 22 for the development of the virtual model 2 of the installation. The screen data 4, which are denoted in the following as digital screen data, are fed to an evaluation and control apparatus 5. The evaluation and control apparatus 5 processes, along with the screen data 4, component data 13 from a component library 6 that are stored in a second storage device 21 of the apparatus 22. The second storage device 21 for the component library 6, moreover, contains a subregion 24 of storage for storing structural information 23 for the components 6 of the installation. In the exemplary embodiment represented in FIGURE 1, it is symbolized by means of the arrow 14 that the evaluation and control apparatus 5 is also in the position to process user data 14 from a user 7. The output data 27 at the output of the evaluation and control apparatus 5 serve as input data for a virtual model 2 of the installation. A screen 8 forms a display apparatus for the representation of the real installation (1) represented by the screen data 20, the components 6 of the installation, and the generated virtual model 2 of the installation.

The central element of the apparatus 22 represented in FIGURE 1 for the development of a virtual image 2 of the real installation 1 is the evaluation and control apparatus 5. The control and evaluation apparatus 5 performs a screen analysis in which geometric information that are contained in the digital screen data 4 are recognized and brought into agreement with the

geometric information contained in the component information 13. The screen analysis 5 determines, if necessary user-controlled with the aid of the user data 14, the position and alignment of the individual components 13 of the installation. The user 7 is informed via the screen 8 of the current status of the virtually developed installation 2 in each phase of the development and can, if needed, engage in a supporting role in the development process, as is still to be explained in connection with Figures 2 to 8.

FIGURE 2 shows a section of the screen that can be represented on the screen 8 of the apparatus represented in FIGURE 1. In one region 9 of the screen is shown thereby a digital image 4 of the real installation based on digital screen data, which reaches the screen 8 via the evaluation and control apparatus (cf. FIGURE 1). The screen 8 has, moreover, so-called icon bars 12a, 12b, 12c that serve as an interface for the user. The icon bars each contain control elements, for example, for selecting, accessing, and moving screen data and/or components. The right region of the screen contains, in its upper region 10 of the screen, a screen window 13 that serves to represent individual components of the installation. These components of the installation are selectable with the aid of the icon bar 12a. The lower right region 11 of the screen contains a third screen window 15 that serves to represent the virtual installation, that is, the components of the installation that are already assigned to the "real" installation via screen data, represented in screen window 4. Moreover "camera control," that is, a movement in three-dimensional space of the components represented in the regions of the screen 13, 15 is possible via control bars 12c, 12d. Instead of or in addition to icon bar 12a for the selection of the components, their own additional view with components represented graphically or as objects can be provided on the screen 8.

The section of the screen represented in FIGURE 1 is used, for example, after calling certain digital screen data 4 and forms the departure point for the development of the virtual model of the installation. In the case of less complex installations the user can start automatic operation proceeding from the "real" installation represented in the left region of the screen in which one after the other the individual components from the component library are called and the evaluation and control apparatus attempts to assign them to the digital screen data 4. The evaluation and control apparatus thereby evaluates according to a predetermined search key the informational data assigned to each component to be placed. Thus one evaluation can relate to geometric data belonging to the component, a second evaluation relates to the structural data assigned to the component. An additional triggering in the development of the virtual model of the installation can be done with the aid of the components already positioned and the gaps still existing. Thus, for example, the search schema can be limited by, in the region of an already placed component "tank" that has the informational data "connection valve position xxx," merely the component with the property "valve" being tested. In the case of complex installation structures, manual operation occurs as a rule, at least in part, as is still to be explained in connection with the figures 3 to 7.

FIGURE 3 shows a section of the screen with a view of the real installation 4 and with a second view of a tank component 16a of the installation. The virtual component 16a of the installation is the virtual image of the real tank 16b shown in the digital screen data 4. In the case of the exemplary embodiment represented in FIGURE 3, the representation in the region 10 of the screen was accomplished by the user with the aid of the menu bar 12a. By means of a broken arrow 17a drawn in, it is symbolized that the user moves the virtual tank component 16a of the installation into the left region of the screen for the digital screen data 4 and positions it in the

region of the real tank 16a [sic]. The user consequently selects the component of the installation in the component view 10 and drags it onto the screen view 4 of the image (drag-and-drop process).

FIGURE 4 shows the next step after dropping the virtual component 16a of the installation in the left region of the screen of the real installation 4. With the aid of the part 17b, it is symbolized that the virtual component 16a of the installation was dragged into the left region of the screen and dropped into the region of the real tank 16b. With the aid of the screen analysis of the evaluation and control apparatus it is attempted to bring the geometric characteristics of the component 16a of the installation into agreement with geometric characteristics of the section of the screen in the ambient field of this position. Hereby, for example, edges or combinations of edges are evaluated. After successful evaluation the component 16a of the installation is assigned, with respect to position and alignment, to the digital screen data 4 and marked appropriately. At the same time, in the right lower section 11 of the screen, a so-called instanciation of the virtual component 16a of the installation in the virtual model of the installation occurs. Therewith the virtual object 16a of the installation appears in the view of the installation represented in the region 11 of the screen.

FIGURE 5 shows an additional example of placing a component of the installation in the region of the digital screen data 4. For this purpose, a valve 18a is represented in the right upper region 10 of the screen, which was activated by means of the menu bar 12a from the library of components of the installation. With the aid of the menu bar 12b, the valve 18a is led, on the line marked by the broken arrow 26a, in the direction of the real valve 18b and dropped there.

FIGURE 6 shows the virtual valve 18a dropped in the left region 9 of the screen, where, in addition, the virtual tank 16a already recognized and placed is also represented. In the right lower plane 11 of the screen is represented the virtual view of the installation thus arising, consisting of

the virtual tank 16a of the installation and the virtual valve 18a. Insofar as the positioning of a component of the installation cannot be done automatically, then the positioning and alignment of the component of the installation can also be done by the user. Thereby geometric characteristics analyzed in the screen are set in agreement with the geometric characteristics of the component of the installation. Insofar as geometric information available in a screen view of the digital screen data 4 is not sufficient for an assignment, then it can be attempted to affect the assignment of that component of the installation via other representation images in the form of digital screen data 4.

FIGURE 7 shows, as a further example, the assignment of a conduit 19a to the real installation shown in the left screen view of the digital screen data 4. In the right lower section 11 of the screen it can be seen which components of the installation have already been detected in the virtual view of the installation.

FIGURE 8 shows, in the example of a virtual component 16a of the installation, which is represented in the right upper section 10 of the screen, the assignment of additional structural data 23, which are represented in the left region of the screen. These structural data contain, for example, specifications of the size and the connection capabilities of the tank 16a. The structural data 23 can be evaluated during the assignment of the tank to the digital screen data and thus support an alignment and positioning of the respective component of the installation. Thereby the structural data are used, for example, to generate assumptions of how an additional component could be produced and/or where an additional component could lie.

So that an effective functionality of the virtual model of the installation is achieved, the individual components of the model of the installation contain an pointer to the screen data used for the respective setup. The components of the installation recognize thereby along with the

reference to their respective screen also their respective position in the screen. The screens, i.e. the digital screen data, contain for their part pointers to the components contained in the model 11 of the installation that have a reference to the screen.

FIGURE 9 shows an informational, operating, and/or observational system 31 on the basis of the virtual model 2 of the installation, generated with the aid of the apparatus 22 represented in FIGURE 1. The informational, operating, and/or observational system 31, which is designated in the following also as B&B system for short, is coupled via a converter 30 to the virtual model 2 of the installation. Via a bi-directional connecting line the O&O system is moreover coupled to the real installation 1. The parts of the apparatus 22 for the generation of the virtual model of the installation correspond to those of the exemplary embodiment represented in FIGURE 1 so that the reference is with respect to the description of the apparatus 22, and their reference numbers on the embodiments for FIGURE 1.

The information 13, 23 contained in the virtual model 2 of the installation or in the components from the component library 6 can find application in different, retroactively connected systems. As an example, use for operating and observational systems (for example, WinCC of Siemens) is pointed out here. The converter 30 extracts and converts from the virtual model 2 of the installation the information relevant to the operating and observational system 31. Separate engineering of the operating and observational system is omitted or is drastically reduced. The operating and observational system 30 is connected to the real installation, and is in the position to display the current state of the process, for example with the aid of a three-dimensional visualization based on the virtual model of the installation. Via the defined operating elements of the components, engagement in the process is made possible.

Additional systems that could be set up on the virtual model of the installation are, for example, control, simulation system, diagnosis system, and information system.

The fundamental advantage of a coupling of the virtual model of the installation with the real installation 1 consists of the virtual installation serving not merely as a static visualization and documentation of the installation 1, but rather, beyond this, a plurality of additional real functions with respect to information, operations, and observation of the real installation can be taken over. Thus with the aid of the virtual model 2 of the installation, which represents an exact image of the real installation 1 with respect to the defined functions, for example dangerous areas, widely removed areas, areas that are difficult to access, etc., are monitored without difficulties with exact visualization. With the aid of fictitious simulation data, simulations, for example for training purposes, are also possible with the aid of the virtual model of the installation.

FIGURE 10 shows an exemplary embodiment of a data model for the setup of the component library 6, of the virtual model 2 of the installation and its connections, as can be used in connection with the apparatus 22 represented in figures 1 to 10. Therein the reference numbers already introduced in connection with figures 1 to 9 are used insofar as this is possible. In a screen storage device 20 (= first storage device in figures 1 and 9) screen data 201 also denoted as sources in the following, for example, digital screen photographs or CAD drawings and the screen information 202, 203, 204, 205 connected therewith are stored. The information contained in the source 201 of the screen storage device 20 is converted by the evaluation and control apparatus 5 into a prepared source 51. For a source assignment 52 it is described with the aid of a geometric assignment 54 which geometric elements 53 of a component 61 could be brought into agreement with geometric elements of a prepared source. The second storage device 6 of the

component library contains pre-prepared components, for example tank, valve, conduits, . . . (cf. description figures 1 to 9). The third storage 2 of the virtual model of the installation contains the components 61 of the virtual installation, the information on the prepared sources 51, and the assignment information 52 between components 61 and prepared screens 201.

The data model represented in FIGURE 10 is described with the aid of the UML notation (Unified Modeling Language). Therein the notation used possesses the following semantics. A so-called class describes one informational unit, for example, the informational unit "component." One class can possess one or more attributes where the attributes determine the concrete characteristics or the status of a class or instance (attribute values). Thus the class "structural information" 62 possesses the attribute "+component type." Classes can set up associations (relations) to other classes or to themselves. A relation describes which assignments between classes exist in the sense of a so-called role (for example, analyzed components) and the cardinality (0, . . . , n meaning none, one, or more assignments).

Relations that set up a "consists of" role to another class are designated via the diamond, for example, one component consists of structural information 61, physical processes 63, control processes 64. A further special relation is inheritance, which is characterized via a small triangle at the end of a so-called superclass. Inheritance specifies that characteristics of a subclass have been derived from the superclass, the subclass thus inheriting the characteristics of the superclass. Thus, for example, the subclasses point 55, line 56, curve 57 inherit the characteristics of the superclass geometric element 53. To these characteristics belong, along with the attributes, also the relations and the methods of a class not described in more detail. The data structure shown in FIGURE 10 is in the position to use two different sources 201. Both source types (subclasses) describe a view of an installation to be imaged. Screen 202 is a source

type that represents a digital screen that is composed of several pixels 204. CAD drawing 203 is a source type that represents a CAD drawing 203 that is composed of CAD elements 205 (lines, polygons, arcs, . . .).

The information contained in a source 201 is converted by the evaluation and control apparatus 5 into a prepared source 51. Thereby either the pixels 204 of a screen 202 or the CAD elements 204 of a CAD drawing 203 are converted into geometric elements 53 (for example, point 55, line 56, curve 57, . . . , 58). On the basis of the geometric elements 53, the evaluation and control apparatus 5 can attempt to assign selected components 61 of a prepared source 51.

The evaluation and control apparatus 5 attempts, automatically or in an interaction with the user, to identify and add to the virtual model 2 of the installation components in prepared sources 51, screens 202 or CAD drawings 203. This assignment is done on the basis of the geometric elements 53 that were analyzed in a prepared source 51 or are assigned to the components 61 via the geometric characteristics 68.

If a component 61 of a prepared source 51 could be assigned, then this information is stored in the source assignment 52. The source assignment 52 describes which analyzed components 61 can be assigned to which sources 201. Thereby a component 61 can be assigned via several source assignments 52 to different sources 201.

With the aid of several geometric assignments 54 it is described for a source assignment 52 which geometric elements 53 of a component could be brought into agreement with geometric elements 53 of a prepared source 51.

The virtual model 2 of the installation consists of the components that could be analyzed already. The information of the virtual model 2 of the installation or the components 61 contained in it are used by different retroactively connected systems, for example operating and observational systems.

In summary, the invention thus relates to a process and an apparatus for the development of a virtual model of an installation as an image of a real installation. As database therefore digital screen images that represent images of a real installation serve on the one side, and on the other, components of the installation from a component library. By means of a screen analysis the data for the components of the installation as well as the digital screen data for the real installation are evaluated. With the aid of this evaluation an assignment of each of the recognized components of the installation to the virtually generated model of the installation is made. The virtual image of the real installation thus generated assists the documentation of the actual setup of the installation as well as a simplified fault analysis in case of failure. Along with storing geometric data, functional data and the like for the components of the installation can also be stored for the components of the installation.

Claims

1. Apparatus (22) for the development of a virtual model (2) of an installation as an image of a real installation (1), with a storage device (20) for storing screen data (4) for the real installation (1), with a second storage device (21) for storing informational data (13, 23) of components (13) of the installation from a component library (6), with a third storage device (28) for storing the virtual model (2) of the installation, and with an evaluation and control apparatus (5) for the comparison of the informational data (13, 23) of the components (13) of the installation with the screen data (4) of the real installation (1), for the recognition of components (13) of the installation in the screen data (4), for the derivation of assumptions concerning components in the screen data, and for the generation of each recognized component (13) of the installation in the virtual model (2) of the installation.

2. Apparatus according to claim 1 characterized by the fact that the evaluation and control apparatus (5) for the screen analysis of the screen data (4), of the informational data for components (13) of the installation from a component library (6), of the current status of the virtual model (2) of the installation, of the current status of the virtual model of the installation, and/or of additional information (14) from a user is provided.

3. Apparatus according to claims 1 or 2 characterized by the fact that the evaluation apparatus (5) for screen analysis (5) of geometric information of screen data (4), and/or the components (13) of the installation from the component library (6) is provided.

4. Apparatus according to claims 1 to 3 characterized by the fact that the apparatus has a display apparatus (8) for the representation of three views (9, 10, 11) where the first view (9) for

the representation of the real installation based on the screen data (4), the second view (10) for the representation of the informational data (13, 23) for the components (13) of the installation from the component library (6), and the third view (11) for the representation of the virtual model (13) of the installation are provided.

5. Apparatus according to claims 1 to 4 characterized by the fact that the evaluation and control apparatus (5) for control of the setup of the virtual model (2) of the installation is provided in such a way that a component (13) of the installation selected from the component library (6) is provided for shifting into the first region (9) of the screen assigned to the representation of the screen data (4) for the real installation (1).

6. Apparatus according to claims 1 to 5 characterized by the fact that the evaluation and control apparatus (5) brings the component of the installation selected and shifted into the first [sic] into agreement with the component of the real installation recognizable in the screen by an evaluation, in particular for geometric characteristics, and after successful detection assigns it to this component.

7. Apparatus according to claims 1 to 6 characterized by the fact that the structural information (23) assigned to the component (13) of the installation, in particular for geometric and functional information for the assignment of the components (13) of the installation to the screen data (4) is evaluated as well.

8. Apparatus according to claims 1 to 7 characterized by the fact that the evaluation and control apparatus (5) for adding a component (13) of the installation to the third view (11) of the virtual model (2) of the installation after successful recognition is provided.

9. Apparatus according to claims 1 to 8 characterized by the fact that the evaluation and control apparatus (5) for control of an automatic function is provided in which components of the installation are automatically selected, positioned, and added into the model (2) of the installation.

10. Apparatus according to claims 1 to 9 characterized by the fact that for the generation of the screen data (4) a digital photoapparatus, a digital video camera, digitized photographs, and/or data from a CAD system are provided.

11. Apparatus according to claims 1 to 10 characterized by the fact that for the registration of the screen data (4) of the real installation (1) various views of the real installation (1) are provided.

12. Process for the development of a virtual model (2) of an installation as an image of a real installation (1) in which the virtual model (2) of the installation is generated from screen data (4) for the real installation (1) by information data (13, 23) for components (13) of the installation from a component library (6) being compared with the screen data (4) for the real installation (1) and on agreement each recognized component (13) of the installation being added to the virtual model (2) of the installation.

13. Process according to claim 12 characterized by the fact that the screen data (4) and the data for the components (13) of the installation from the component library (6) are subjected to a screen analysis (5) in which the information of the screen data (4), the components (13) of the installation, and/or information from a user (7) are evaluated.

14. Process according to claims 12 or 13 characterized by the fact that in the screen analysis (5) geometric information of the screen data (4) and/or of the components (13) of the installation from a component library (6) are evaluated.

15. Process according to claims 12 to 14 characterized by the fact that in the development of the virtual model (2) of the installation three views (9, 10, 11) are represented on a display apparatus (8) where the first view (9) for the representation of the screen data (4) for the real installation, the second view (10) for the representation of the components (13) of the installation from the component library (6), and the third view (11) for the representation of the virtual model (2) of the installation are provided.

16. Process according to claims 12 to 15 characterized by the fact that for the construction of the virtual model (2) of the installation from the component library (6) a component (13) of the installation is selected, that the selected component (13) of the installation is shifted into the region (9) of the screen that is assigned to the representation of the real installation.

17. Process according to claims 12 to 16 characterized by the fact that the screen analysis (5) brings the shifted component (16a) of the installation into agreement with the component (16b) recognizable in the screen for the real installation (1) with an evaluation, in particular for geometric characteristics, and after successful detection assigns these components to one another.

18. Process according to claims 12 to 17 characterized by the fact that structural information (23) are assigned to the virtual components (16a) of the installation that are evaluated as well for the assignment of the components (13) of the installation to the screen data (4).

19. Process according to claims 12 to 18 characterized by the fact that after successful recognition of a component the recognized component is added in the third view (11) of the virtual model (2) of the installation.

20. Process according to claims 12 to 19 characterized by the fact that the process has an automatic screen analysis in which components of the installation are automatically selected, positioned, and selected [sic].

21. Process according to claims 12 to 20 characterized by the fact that the screen data (4) are generated by means of a digital photo apparatus, by means of a digital video camera, by means of digitized photographs, and/or by means of data from a CAD system.

22. Process according to claims 12 to 21 characterized by the fact that the screen data (4) of various views of the real installation are used where on successful recognition of a component (13) of the installation an automatic assignment of the recognized component (13) of the installation to the screen data occurs.

Abstract

Apparatus and process for the development of a virtual model of an installation.

The invention relates to a process as well as an apparatus for the development of a virtual model (2) of an installation as an image of a real installation (1). As database therefore digital screen images (4) that represent images of a real installation (1) serve on the one side, and on the other, components (13) of the installation from a component library (6). By means of a screen analysis (5) the data for the components of the installation as well as the digital screen data (4) of the real installation (1) are evaluated. With the aid of this evaluation an assignment of each of the recognized components (13) of the installation to the virtually generated model (2) of the installation is made. The virtual image of the real installation thus generated assists the documentation of the actual setup of the installation as well as a simplified fault analysis, by way of example, in the case of areas that are difficult to access and/or operation or observation of the installation. Functional data and the like for the components of the installation can also be stored along with geometric data.

FIGURE 10